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Report of the individual review of the inventory submission of Kazakhstan submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2013 inventory submission of Kazakhstan, coordinated by the UNFCCC secretariat, in accordance with decision 19/CP.8. The review took place from 9 to 14 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Leena Raittinen (Finland) and Mr. Dennis Rudov (Belarus); energy – Ms. Lindiwe Chola Dlamini (Swaziland), Ms. Veronika Ginzburg (Russian Federation) and Ms. Inga Konstantinaviciute (Lithuania); industrial processes and solvent and other product use – Ms. Siriluk Chiarakorn (Thailand) and Mr. Thapelo C.M. Letete (South Africa); agriculture – Ms. Yauheniya Bertash (Belarus) and Ms. Hongmin Dong (China); land use, land-use change and forestry (LULUCF) – Ms. Maria Fernanda Alcobé (Argentina) and Mr. Vladimir Korotkov (Russian Federation); and waste – Mr. Pavel Gavrilita (Republic of Moldova) and Ms. Tatiana Tugui (Republic of Moldova). Mr. Rudov and Ms. Tugui were the lead reviewers. The review was coordinated by Ms. Suvi Monni (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (hereinafter referred to as the UNFCCC review guidelines), a draft version of this report was communicated to the Government of Kazakhstan, which made no comment on it. All encouragements and recommendations in this report are for the next inventory submission, unless otherwise specified.

3. In 2011, the main greenhouse gas (GHG) in Kazakhstan was carbon dioxide (CO_2), accounting for 78.2 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (17.7 per cent) and nitrous oxide (N_2O) (3.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.8 per cent of the overall GHG emissions in the country. The energy sector accounted for 84.5 per cent of total GHG emissions, followed by the agriculture sector (7.8 per cent), the industrial processes sector (6.3 per cent) and the waste sector (1.5 per cent). Total GHG emissions amounted to 274,460.52 Gg CO_2 eq and decreased by 23.4 per cent between the base year and 2011. The expert review team (ERT) concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions under the Convention, by gas and by sector, respectively. In table 1, CO_2, CH_4 and N_2O emissions do not include emissions and removals from the LULUCF sector.

5. Additional background data on recalculati[illegible]y Kazakhstan in the 2013 inventory submission can be found in annex I to this report.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

Table 1
Greenhouse gas emissions by gas, 1990 to 2011

	Gg CO_2 eq								(%)
Greenhouse gas	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*2011*	*Change 1990–2011*
CO_2	268 730.18	161 474.97	133 106.47	180 740.70	186 513.22	206 792.56	226 640.28	214 717.46	–20.1
CH_4	73 327.77	44 504.22	33 030.67	37 748.66	44 852.24	44 654.04	48 326.48	48 634.38	–33.7
N_2O	16 319.71	8 943.72	5 662.60	7 544.23	8 308.85	8 873.05	8 962.00	8 936.71	–45.2
HFCs	NA, NO	0.21	164.19	237.12	606.49	646.76	837.37	843.56	NA
PFCs	NA, NO	NA, NO	NA, NO	NA, NO	567.27	678.93	1 201.50	1 328.41	NA
SF_6	NA, NO	NA, NO	NA, NO	0.15	0.11	3.31	NA, NO	NA, NO	NA

Abbreviations: NA = not applicable, NO = not occurring.

Table 2
Greenhouse gas emissions by sector, 1990 to 2011

	Gg CO_2 eq								(%)
Sector	*1990*	*1995*	*2000*	*2005*	*2008*	*2009*	*2010*	*2011*	*Change 1990–2011*
Energy	299 576.11	180 550.49	144 113.45	190 447.95	201 458.40	222 221.59	244 609.22	231 802.61	–22.6
Industrial processes	17 916.83	8 144.59	10 226.43	13 258.11	14 383.47	13 598.40	15 108.77	17 159.66	–4.2
Solvent and other product use	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA, NE	NA
Agriculture	38 144.51	23 121.10	14 529.43	19 091.84	21 262.26	21 987.11	22 295.96	21 432.69	–43.8
LULUCF	–2 166.55	–7 291.30	–10 117.98	–2 857.98	–2 472.44	–2 481.41	–2 890.50	–3 093.61	42.8
Waste	2 740.21	3 106.93	3 094.62	3 472.95	3 744.05	3 841.55	3 953.68	4 065.56	48.4
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	**356 211.11**	**207 631.81**	**161 845.94**	**223 412.88**	**238 375.74**	**259 167.24**	**283 077.12**	**271 366.91**	**–23.8**
Total (without LULUCF)	**358 377.66**	**214 923.11**	**171 963.93**	**226 270.86**	**240 848.18**	**261 648.65**	**285 967.63**	**274 460.52**	**–23.4**

Abbreviations: LULUCF = land use, land-use change and forestry, NA = not applicable, NE = not estimated.

II. Technical assessment of the inventory submission

A. Overview

1. Inventory submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013 with revisions submitted on 28 May 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. The inventory submission was submitted in accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

7. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

8. Table 3 contains the ERT's overall assessment of the inventory submission of Kazakhstan. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the inventory submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 inventory submission		The ERT strongly recommends that Kazakhstan improve completeness by including estimates for all mandatory categories and encourages the Party to include estimates for non-mandatory categories. The ERT also recommends that the Party use notation key "NO" if activity is not occurring and "IE" if emissions are included elsewhere
Non-land use, land-use change and forestry[a]	Not complete	Mandatory: "NE" is reported for CO_2 and CH_4 emissions from oil exploration, CO_2 emissions from oil transport, CH_4 emissions from oil transport (1990–1996), CO_2 and CH_4 emissions from natural gas exploration (2001–2011), CO_2 emissions from natural gas transmission (1991–2011), CO_2 emissions from natural gas distribution, CO_2 emissions from coke in iron and steel production and indirect N_2O emissions from leaching and run-off
		No notation key or numerical value is reported for CO_2, CH_4 and N_2O emissions from railways – solid fuels (2010), CO_2, CH_4 and N_2O emissions from navigation – gasoline (2011), CO_2 and CH_4 emissions from natural gas exploration (1990–2000), CO_2 and CH_4 emissions from venting and CO_2, CH_4 and N_2O emissions from gas flaring; CH_4 emissions from carbon black, ethylene, dichloroethylene, styrene and methanol; and HFCs, PFCs and SF_6 emissions from foam blowing, fire extinguishers, aerosols/metered dose inhalers, solvents, other applications using ODS substitutes and semiconductor manufacture

		General findings and recommendations
		Non-mandatory: "NE" is reported for CO_2, CH_4 and N_2O emissions from aviation bunkers (1990–2008), CO_2, CH_4 and N_2O emissions from marine bunkers – gas/diesel oil, CO_2 emissions from underground mines, N_2O emissions from oil refining/storage, CO_2 emissions from other leakage, CO_2 emissions from asphalt roofing, CO_2 emissions from road paving with asphalt, CH_4 emissions from calcium carbide, CO_2 emissions from other (chemical industry), CO_2 emissions from other production, and CO_2 and N_2O emissions from solvent and other product use
		No notation key or numerical value is reported for CO_2, CH_4 and N_2O emissions from marine bunkers (except gas/diesel oil), CO_2 and N_2O emissions from ethylene, potential emissions of HFCs, PFCs and SF_6 – import and export, and indirect GHGs in several subcategories, in particular in transport and fugitive emissions from fuels
Land use, land-use change and forestry[a]	Not complete	Mandatory: "NE" is reported for net CO_2 emissions from forest land remaining forest land – mineral soils, net CO_2 emissions from grassland converted to forest land – mineral soils, net CO_2 emissions from wetlands converted to forest land – organic soils, net CO_2 emissions from cropland remaining cropland – soils, net CO_2 emissions from grassland remaining grassland – mineral soils, net CO_2 emissions from forest land converted to grassland – dead organic matter and mineral soils, net CO_2 emissions from other land converted to wetlands, N_2O emissions from disturbance associated with land-use conversion to cropland – grassland converted to cropland – mineral soils, and CO_2, CH_4 and N_2O emissions from biomass burning – grassland remaining grassland – wildfires
		"NO" is reported for area and carbon stock changes in forest land converted to other land-use categories (except for carbon stock changes in dead organic matter and mineral soils for forest land converted to grassland, which are reported as "NE"), whereas according to the NIR, the area of forest land is decreasing (see para. 76 below)
		Non-mandatory: "NE" is reported for net CO_2 emissions from cropland remaining cropland – dead organic matter, net CO_2 emissions from grassland remaining grassland – dead organic matter, net CO_2 emissions from wetlands remaining wetlands – living biomass, net CO_2 emissions from settlements remaining settlements – dead organic matter and soils, net CO_2 emissions from grassland converted to settlements – soils (1991–1995, 2004, 2006–2011) and net CO_2 emissions from other land converted to settlements – soils (1990 and 2011)
The ERT's findings on recalculations and time-series	Generally consistent	Category-specific findings on time-series consistency are presented in paragraphs 28, 45 and 54 below

		General findings and recommendations
consistency in the 2013 inventory submission		Recalculations have been performed for several categories (annex I). The ERT commends Kazakhstan for recalculations performed in response to the review process (see para. 16 below) The ERT noted insufficient explanations of recalculations in CRF table 8(b) as well as in the category-specific chapters of the NIR and recommends that the Party report transparently on all recalculations
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 inventory submission	Not sufficient	The ERT reiterates the recommendations that the Party strengthen QA/QC activities, implement its QA/QC plan and provide more information in the NIR on the category-specific QA/QC procedures applied Category-specific findings and recommendations on QA/QC are presented in paragraphs 29, 49, 78, 85 and 92 below
The ERT's findings on the transparency of the 2013 inventory submission	Not sufficient	The structure of the NIR presented in annex I to the UNFCCC reporting guidelines has not been fully followed (for example, chapter 1.8 on assessment of completeness is not included in the NIR). The ERT recommends that the Party bring the structure of the NIR into full accordance with the UNFCCC reporting guidelines; provide a list of recommendations from the previous review report with an indication of performed improvements; and provide a list of planned improvements with timelines in the NIR The category-specific recommendations where the ERT finds transparency could be improved are listed in paragraphs 23, 25, 26, 28, 40, 50, 53, 55, 61, 64, 65, 67, 69, 71, 75, 81, 82, 86 and 93 below

Abbreviations: CRF = common reporting format, ERT = expert review team, IE = included elsewhere, indirect GHGs = nitrogen oxides, carbon monoxide, non-methane volatile organic compounds and sulphur dioxide, LULUCF = land use, land-use change and forestry, NE = not estimated, NIR = national inventory report, NO = not occurring, ODS = ozone-depleting substances, QA/QC = quality assurance/quality control, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

9. The NIR and additional information provided by the Party during the review described the institutional arrangements for the preparation of the inventory. The Ministry of Environmental Protection (MoEP) has overall responsibility for the national inventory, including the official submission to the UNFCCC secretariat. The Kazakh Scientific Research Institute of Ecology and Climate (KazNIIEK), under the supervision of MoEP, is responsible for the planning, preparation and management of the national inventory,

including the selection of methodologies and emission factors (EFs), collection of activity data (AD), development of new statistical forms for the needs of the inventory and keeping the inventory archive (see para. 14 below). The Agency of Statistics of the Republic of Kazakhstan provides annual information on industrial production and energy balance, and other ministries and agencies such as the Ministry of Agriculture, the Ministry of Economics and Budget Planning, and the Agency for Land Resources Management provide the rest of the information.

10. The ERT noted that in the 2013 inventory submission Kazakhstan revised the description of the national system and provided extended information on institutional arrangements for the inventory preparation, including the roles and responsibilities of all participating institutions. The ERT commends Kazakhstan for this improvement.

11. KazNIIEK is the organization responsible for annually planning and performing quality assurance/quality control (QA/QC) activities. According to the NIR, an independent external review may be performed. In response to a question raised by the ERT during the review, Kazakhstan explained that the 2013 inventory submission has not been subject to external peer review due to the lack of funding. The ERT encourages the Party to carry out an external peer review and present its results in an annex to the NIR.

12. The ERT noted that Kazakhstan included in the NIR the template of the checklist for the annual QC procedures, following the recommendation in the previous review report. The ERT commends the Party for this improvement, which improves transparency. In response to a question raised by the ERT during the review, the Party explained that the set of QA/QC activities is generally the same each year; however, a designated person is responsible for adjusting the time frames for performing them, depending on the progress of the inventory preparation. The ERT recommends that the Party include this clarification in the NIR.

Inventory preparation

13. Table 4 contains the ERT's assessment of Kazakhstan's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Kazakhstan

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	Level and trend key category analysis performed, including and excluding LULUCF. The ERT welcomes the elaboration of the NIR annex with the key category analysis. However, the ERT noted inconsistencies in the reporting of key categories between CRF table 7 and tables in appendix 2 to the NIR. The ERT recommends that the Party ensure consistency of the reporting in the NIR and the CRF tables, and follow the recommended level of disaggregation described in chapter 5.4 of the IPCC good practice guidance for LULUCF

		General findings and recommendations
Approach followed?	Tier 1	
Were additional key categories identified using a qualitative approach?	No	
Does the Party use the key category analysis to prioritize inventory improvements?	No	The ERT reiterates the recommendation that the Party include in the NIR the information on whether the key category analysis is used to prioritize the development and improvement of the inventory
Are there any changes to the key category analysis in the latest submission?	Yes	The LULUCF sector has been included in the key category analysis and forest land remaining forest land was identified as a key category in 2011
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out consistent with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Category-specific findings and recommendations are in paragraphs 62 and 77 below The ERT considers that the level uncertainty may be too low, taking into account numerous recommendations regarding the AD and EFs, as well as the significant recalculations made for the entire time series. The ERT recommends that the Party review its uncertainty estimates and ensure that the estimates are performed according to the IPCC good practice guidance and the IPCC good practice guidance for LULUCF
Quantitative uncertainty (including LULUCF)	Level = 3.9%	
	Trend = 2.2%	
Quantitative uncertainty (excluding LULUCF)	Not provided	The ERT encourages the Party to report the uncertainties excluding LULUCF

Abbreviations: AD = activity data, CRF = common reporting format, EFs = emission factors, ERT= expert review team, IPCC = Intergovernmental Panel on Climate Change, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

14. Kazakhstan has a centralized archiving system, based on KazNIIEK, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures and is stored in

hard copy as well as in electronic format, for which a special data storage server was purchased.

15. The ERT noted that the description of the archiving system has not changed since the previous inventory submission, and therefore it reiterates the recommendations made in the previous review report that the Party provide, in the NIR, more information on: the archiving system, including the responsibilities of different institutions for the flow of data and archiving; whether the archiving system includes information generated through external and internal reviews, documentation on annual key category analysis, key category identification and planned inventory improvements; and how this system is maintained by KazNIIEK.

4. Follow-up to previous reviews

16. In response to the recommendations made in the previous review report, in its 2013 inventory submission, Kazakhstan made a number of improvements, including:

(a) Improved completeness (see paras. 36, 42, 55 and 60 below);

(b) Recalculations for solid waste disposal on land;

(c) Reporting of key categories in CRF table 7;

(d) Generally improved transparency on cross-cutting issues (see paras. 10 and 12 above), and addition of an annex with an assessment of completeness and a comparison of the sectoral and reference approaches.

17. The ERT noted that several recommendations made in the previous review report have not been addressed. The ERT reiterates the recommendations made in the previous review report and recommends that the Party:

(a) Estimate emissions and removals for mandatory categories and use appropriate notation keys (see table 3);

(b) Include more information in the NIR on cross-cutting issues (see tables 3 and 4 and para. 15 above);

(c) Investigate the allocation of AD and emissions from coke production from the energy sector to the industrial processes sector, correct any misallocations and provide a carbon balance for iron and steel production to demonstrate complete reporting (see para. 40 below); and implement other pending recommendations in the energy sector (see paras. 23, 25, 27, 28, 35, 37, 39, 43 and 44 below);

(d) Provide more information on the methodology used to estimate emissions from lime production and revise the calculations, if appropriate (see para. 51 below);

(e) Correct the identified error related to feed intake estimates (see para. 65 below), estimate indirect N_2O emissions from leaching and run-off (see para. 72 below) and implement other pending recommendations in the agriculture sector (see paras. 59, 61, 62, 67, 68, and 70 below);

(f) Include net CO_2 emissions from mineral soils in cropland remaining cropland in the inventory (see para. 83 below), and implement other pending recommendations in the LULUCF sector (see paras. 75, 77, 78, 80, 82 and 84–88 below).

5. Areas for further improvement identified by the expert review team

18. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 7.

B. Energy

1. Sector overview

19. The energy sector is the main sector in the GHG inventory of Kazakhstan. In 2011, emissions from the energy sector amounted to 231,802.61 CO_2 eq, or 84.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 22.6 per cent. The key driver for the fall in emissions is the large reduction of fossil fuel consumption during the process of the establishment of a new independent State (associated with a deep economic crisis) in 1991 and the accompanying social and economic reforms during the 1990s. A stable growth of the energy sector emissions can be observed since 2001. A decrease in the emissions occurred in 2007 and 2008, followed by an increase in the following two years and a small reduction again in 2011.

20. Within the sector, in 2011, 40.6 per cent of the emissions were from energy industries, followed by the categories other (17.6 per cent), manufacturing industries and construction (11.4 per cent) and fugitive emissions from solid fuels (9.9 per cent). Transport accounted for 8.7 per cent and other sectors accounted for 7.5 per cent. The remaining 4.4 per cent were fugitive emissions from oil and natural gas.

21. The ERT noted from appendix 3 to the NIR that the national energy balance for 2011, which was used as AD for the inventory in the energy sector, shows a 19 per cent difference between apparent consumption and total sectoral consumption of coal. The differences between apparent consumption and total sectoral consumption of oil and natural gas are 4 and 19 per cent, respectively. According to the NIR, this is due to the fact that not all enterprises report fuel consumption statistics to the statistical agency. The ERT considers that this could lead to a potential underestimation of GHG emissions from stationary combustion (see also para. 32 below). The ERT recommends that the Party ensure close cooperation between the inventory team and the statistical agency to minimize the difference by improving the data collection for statistics, by applying appropriately documented expert estimates or by using statistical calculation tools.

22. Kazakhstan used the notation keys "NO" (not occurring) and "NA" (not applicable) to report CO_2, CH_4 and N_2O emissions from other fuels in all subcategories in stationary combustion for 2009–2010, and in all subcategories except other (manufacturing industries and construction) for 2011. In addition, biomass use is reported as "NO" for several subcategories. The ERT noted that Kazakhstan reported in the NIR that other fuels and biomass combusted in the stationary combustion categories are not counted by the statistical agency. In response to a question raised by the ERT during the review, Kazakhstan clarified that these amounts are included elsewhere. The ERT recommends that, in the CRF tables, the Party use the notation key "IE" (included elsewhere) instead of "NO" or "NA" in cases in which emissions are included elsewhere, and include appropriate explanations in CRF table 9(a) and the NIR.

23. Following the recommendation made in the previous review report, Kazakhstan provided explanations of the recalculations in CRF table 8(b). The ERT commends Kazakhstan for this improvement in transparency. However, the NIR still does not provide sufficient information on the reasons for and the methodology used in the recalculations. The ERT therefore reiterates the recommendations made in a number of previous review reports that Kazakhstan report in the NIR all information regarding the reasons for recalculations and the methodologies used for the recalculated categories, to improve transparency.

24. The ERT noted that in the current inventory submission, the Party has followed the recommendation made in the previous review report and used the notation key "NO" for

fugitive CO_2 and CH_4 emissions from distribution of oil products and other (oil) for 2001–2011. The ERT commends Kazakhstan for these improvements.

25. The ERT considers that the reporting of the energy sector has become more transparent since the last inventory submission, but the information provided is still not sufficiently transparent. For example, Kazakhstan has used country-specific net calorific values and EFs for a number of fuels, such as diesel oil, residual fuel oil, heating oil, other fuels, natural gas, coke oven and blast furnace gas. The NIR provides a reference for the relevant documents where these parameters are developed, but does not provide information about the main findings and results of the research carried out to develop the country-specific values. In response to a question raised by the ERT during the review, Kazakhstan provided documents justifying the use of country-specific EFs for estimating CO_2 emissions from coal mining and handling, and for combustion of liquid fuels (diesel oil, residual fuel oil and gasoline), natural gas, coke oven gas and blast furnace gas. The ERT commends Kazakhstan for providing this information and reiterates the recommendation made in the previous review reports that Kazakhstan include this information in the NIR to improve transparency.

26. In response to the recommendation made in the previous review report, Kazakhstan included in the NIR detailed data on energy consumption by fuel for other sectors and other (fuel combustion activities). The ERT commends Kazakhstan for providing this information and recommends that the Party include similar information for all subcategories in the energy sector to improve transparency.

27. In the previous inventory submission, Kazakhstan included all fuels reported as losses in the national fuel balance under the category other (fuel combustion activities). In the previous review report, it was recommended that Kazakhstan separate combusted fuels from other losses, including feedstocks and non-energy use of fuels, and report related emissions in the appropriate categories of the energy sector. In the NIR of the 2013 inventory submission, Kazakhstan has again reported that losses are included in the category other (fuel combustion activities), but no additional explanations have been given. In response to a question raised by the ERT during the review, Kazakhstan clarified that in the national energy balance, losses are given separately by type of fuel, but the activities are aggregated. Thus, it is not possible to report related emissions in the appropriate subcategories of the energy sector. The ERT reiterates the recommendation made in the previous review report that Kazakhstan investigate the possibility of separating combusted fuels from other losses, including feedstocks and non-energy use of fuels, and report related emissions in the appropriate categories of the energy sector (emissions from fuel combustion or fugitive emissions) or, as appropriate, in other inventory sectors.

28. The ERT noted that Kazakhstan has used interpolation to fill in the time series for AD which are not available in national statistics. Economic indicators were used in the interpolation methodology, for example, to disaggregate AD for iron and steel and non-ferrous metals, which are reported together in the national statistics and to fill in the AD time series for 1991, 1993 and 1995–1998. However, there is no transparent explanation of the applied interpolation methodology in the NIR. The ERT reiterates the recommendation made in the previous review report that Kazakhstan explain the underlying assumptions and the degree of expert judgement used and report it in the NIR. The ERT also reiterates the recommendation made in the previous review report that Kazakhstan ensure the consistency of the entire time series and provide in the NIR comparisons of AD obtained from different sources.

29. The ERT noted improvements in the QA/QC procedures in the 2013 inventory submission for the energy sector. This allowed identifying and correction of AD for the reference approach and avoiding double counting of fuels used for transport. The NIR provides information on the application of the QA/QC procedures in the reference approach

and stationary combustion categories. However, the ERT noted that this information is not provided for transport and fugitive emissions. The ERT recommends that Kazakhstan include in the NIR the description of QA/QC procedures applied for transport and fugitive emissions.

2. Reference and sectoral approaches

30. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 31–38 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross references
Difference between the reference approach and the sectoral approach	Energy consumption: not reported CO_2 emissions: 36,676.63 Gg CO_2, 18.60%	31
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	32 and 33
Are differences with international statistics adequately explained?	No	35
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	No	36 and 37
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	38

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

31. Kazakhstan reported apparent energy consumption (excluding non-energy use and feedstocks) as "NA" in CRF table 1.A(c). The ERT recommends that the Party provide this information in the next inventory submission.

32. The ERT noted that the difference between the reference and the sectoral approaches varies widely from year to year, from –0.3 per cent (2005) to 27.3 per cent (2008) and is above 2.0 per cent for almost all years. Since the previous inventory submission, the differences between the reference approach and the sectoral approach have changed because of recalculations made due to the correction of export data for all years. Following a recommendation made in the previous review report, Kazakhstan has included an attachment to the 2013 NIR explaining the differences. Among the main country-specific reasons for the big differences are the differences in the national energy balance between the reference and the sectoral approaches (19 per cent in 2011). As noted in paragraph 21 above, a partial coverage of fuel consumers reported to national statistics may lead to a potential underestimation of sectoral emissions.

33. The ERT noted that the trends of fuel consumption and CO_2 emissions estimated using the reference and the sectoral approaches go in opposite directions between 2010 and 2011: both fuel consumption and CO_2 emissions increased compared with 2010 (2.7 and 2.1 per cent, respectively) according to the reference approach and decreased according to the sectoral approach (5.9 and 6.5 per cent, respectively). However, according to fuel balance data presented in the NIR (annex tables 3.3 and 3.5 and table 3.8 in the main text), in the sectoral approach combustion of coal increased by 5.6 per cent in 2011 compared with 2010, combustion of natural gas remained almost the same, and combustion of liquid fuels decreased by 25.8 per cent. There was no explanation of this contradiction presented in the NIR. In response to a question raised by the ERT during the review, Kazakhstan explained that the initial AD were taken from the national fuel balance of Kazakhstan and that the decrease in emissions in 2011 occurred due to reduced consumption of liquid fuels and increased gas consumption The Party further explained that the difference is associated with the reduction in fuel consumption in the category other (fuel combustion activities) by 23.2 per cent from 751,272.70 TJ in 2010 to 576,701.96 TJ in 2011. The ERT recommends that the Party cross-check the AD and provide explanations of the differences in inter-annual changes between the reference and sectoral approaches.

34. Kazakhstan reported in the NIR that following the recommendation made in the previous review report, attempts to separate coking coal from the total other bituminous coal consumption were made last year but the obtained data were not considered reliable. Therefore, Kazakhstan planned to carry out this activity for the next inventory submission. The ERT recommends that the Party carry out the planned improvement.

35. In the previous review stages, it was noted that the apparent consumption reported to the UNFCCC secretariat differs significantly from that reported to the International Energy Agency (IEA), with discrepancies within 10 per cent for all the available years, except for 2002 (15.1 per cent). The growth rate in the period 1990–2011 for the total apparent consumption is significantly different: –1.9 per cent (CRF) versus 8.5 per cent (IEA). In particular, the natural gas production figures reported in the CRF tables are around 20 per cent larger than in the data reported to IEA for 1993, 2002–2003, 2006 and 2009–2011 and 39.5 per cent lower for 1999; crude oil imports and exports differ significantly for a number of years; IEA solid fuel exports data are 14.7–33.9 per cent higher than those in the CRF tables for 2000–2003, while in 2011 they are 15.4 per cent lower. In addition, solid fuel imports are 23.0 and 14.5 per cent higher in the IEA data for 2005 and 2006, respectively, while from 2007 onwards they are approximately 7–20 per cent lower than the CRF data. The ERT noted that no explanations for the difference in apparent consumption data used in the reference approach and IEA data are given in the NIR. In response to a question raised during the previous stages of the review, the Party explained that the data presented in the CRF tables are based on the national energy balance except for 1991–1998 when the energy balance was not available. The ERT considers that there is still lack of clarity regarding reasons for the significant differences, and reiterates the recommendation made in the previous review report that Kazakhstan carry out a specific analysis to reduce the discrepancies between the energy consumption data reported in the inventory submission and the data reported to IEA, and provide explanations in the NIR.

International bunker fuels

36. Emissions from jet kerosene aviation bunkers were reported for the first time in the 2013 inventory submission. Emissions are reported for 2009–2011 and indicated as "NE" (not estimated) for the rest of the time series. According to the NIR, inclusion of jet kerosene became possible because of close cooperation with the airline companies and the statistical agency. The split of international and domestic aviation was made based on data of fuel consumption including landing and take-off and cruise phases. The ERT commends Kazakhstan for this significant improvement and encourages the Party to continue this

investigation and obtain the required data on fuel consumption, based on available statistics and expert judgement, if necessary, for the years 1990–2008 and report these emissions.

37. The ERT noted that Kazakhstan has not implemented any changes in the estimation of international marine bunkers since the previous inventory submission. The notation key "NE" is used for gas/diesel oil, while no notation keys and no values are reported for other fuel types. The NIR indicates that there is no information about marine bunkers in the national statistics. The ERT reiterates the findings in the annual review reports of 2011 and 2012 that, according to the available international statistics (e.g. IEA data), navigation does occur in Kazakhstan for national and international purposes. The ERT therefore reiterates the recommendation made in the previous review report that Kazakhstan obtain relevant navigation statistics, correctly allocate fuel consumption to international and domestic navigation, and use the appropriate EFs for reporting emissions.

Feedstocks and non-energy use of fuels

38. According to the NIR, Kazakhstan used Intergovernmental Panel on Climate Change (IPCC) default fractions of carbon stored (CSFs) for most fuels. For coking coal, lignite, crude oil and gas a CSF equal to 1 was used and for secondary oil fuels (gasoline, residual fuel oil) the CSF is equal to 0.8. The NIR indicated that the CSFs used are country-specific factors of the Russian Federation, which are used by Kazakhstan because of the similar national conditions. However, the ERT noted that the Russian Federation does not calculate carbon stored for primary fuels, except natural gas, and uses different country-specific CSFs for secondary fuels from the ones used by Kazakhstan. The ERT recommends that the Party check the CSFs used and recalculate carbon stored, if appropriate. If the Party decides to use Russian CSFs, the ERT recommends that the Party provide a justification regarding the applicability of the factors to the inventory of Kazakhstan.

3. Key categories

Stationary combustion: solid fuels – CO_2

39. According to the NIR, Kazakhstan uses the IPCC default EFs to estimate CO_2 emissions from lignite and coals. However, it was noted in the previous review report that country-specific EFs are available for coals from different mining fields. It is explained in the NIR that the country-specific EFs are not used by the Party because statistical data on coal combustion are presented in the national statistics in an aggregated form only for two coal types: lignite and sub-bituminous coal. The ERT reiterates the recommendation made in the previous review report that Kazakhstan investigate the possibility of calculating country-specific CO_2 EFs for lignite and sub-bituminous coal as weighted average values based on information on specific coal production and CO_2 EFs for each mining field, as the majority of coal used in Kazakhstan is from domestic production.

40. Kazakhstan carried out recalculations for manufacturing industries and construction for 1999–2010. In response to a question raised in the previous stages of the review, Kazakhstan explained that the recalculations were carried out in order to remove double counting and further explained that AD on fuel used for the production of coke were allocated to the industrial processes sector. The ERT noted that in the industrial processes sector, AD and CH_4 emissions from coke production are reported under other (chemical industry), whereas CO_2 emissions are reported as "NE". In the category metal production in the industrial processes sector, coke AD and CH_4 emissions are reported as "IE" and CO_2 emissions are reported as "NE" with an explanation "included in the energy sector" in CRF table 2(I).A-G. In response to a question raised by the ERT during the review, the Party explained that the notation key "NE" will be changed to "IE", as all the coke is used in the steel and non-ferrous metallurgy. The ERT considers that there is lack of clarity regarding how the emissions of coke production were reallocated from energy to the industrial

processes sector, and whether all emissions from coke production and consumption are included in the inventory. The ERT reiterates the recommendation made in the previous review report that Kazakhstan carefully investigate the allocation of AD and emissions from the energy sector to the industrial processes sector and correct any misallocations. The ERT also recommends that the Party provide a carbon balance for the iron and steel production and the non-ferrous metals industries in the NIR in order to improve transparency and demonstrate complete reporting.

Stationary combustion: gaseous fuels – CO_2

41. During previous stages of the review, it was noted that the implied emission factor (IEF) for CO_2 from gaseous fuels used in energy industries reported for the entire time series (54.87 t/TJ) is below the IPCC default value (56.10 t/TJ). In response to questions raised during the previous stages of the review, Kazakhstan referred to the changes in the use of coke oven and blast furnace gas and lignite. In response to a follow-up question raised by the ERT during the review, the Party explained that coke oven and blast furnace gas are reported as solid, not gaseous fuels. Therefore, the ERT considered that the response provided by Kazakhstan did not address the issue. The ERT recommends that the Party investigate the reasons for the low CO_2 IEF and provide sufficient and well-documented explanations in the NIR.

Road transportation: liquid fuels – CO_2 and N_2O[2]

42. In the 2013 inventory submission Kazakhstan calculated for the first time emissions from off-road and agricultural transportation using detailed information for 2001–2011 about the type and amount of agricultural, construction and industrial transport and fuel combustion. The ERT commends Kazakhstan for its efforts. However, the ERT noted that emissions from off-road industrial and agricultural transportation are reported in the category road transportation. In response to a question raised by the ERT during the review, Kazakhstan explained that it is planning to reallocate the emissions in the future. The ERT noted that the present allocation is not in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and recommends that Kazakhstan reallocate AD and emissions from transportation in agriculture/forestry/fisheries to the subcategory agriculture/forestry/fisheries and emissions from industrial and construction off-road transport to the category manufacturing industries and construction.

43. The ERT noted that constant IEF values are reported for N_2O from gasoline used by road transportation in 1990–2007 (0.10 kg N_2O/TJ), except for 1992 (0.09 kg N_2O/TJ). The N_2O IEF for 2008–2011 is 0.33 kg N_2O/TJ. As noted in the previous review report, the IEF for N_2O would usually be expected to increase over the time series because of an increase in the use of cars equipped with catalytic converters. The ERT also noted that the N_2O IEFs of Kazakhstan are the lowest among the reporting Parties (ranging from 0.09 to 23.65 kg N_2O/TJ). In the previous review report, it was recommended that the Party improve the accuracy of its N_2O emission estimates from this category, taking into account the pollution control technologies introduced over time in the vehicle fleet or provide a well-documented justification for the use of low constant values for the periods indicated above. However, Kazakhstan did not make any recalculations or provide any explanation of this issue in the 2013 inventory submission. In response to a question raised by the ERT during the review, Kazakhstan explained that the number of vehicles with catalytic converters is growing and that the Party is currently making an attempt to find a way to separate them from the rest of

[2] Not all emissions related to all gases under this category are key categories, particularly N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as whole, the individual gases are not assessed in separate sections.

the car fleet. The Party further stated that the N_2O EF will be checked for the entire time series for the next inventory submission. The ERT reiterates the recommendation made in the previous review reports that the Party improve the accuracy of the N_2O emission estimates from this category, taking into account the pollution control technologies introduced over time in the vehicle fleet. This improvement could be implemented by using internationally recognized models, for example COPERT, for the estimation of emissions from road transportation.

Coal mining and handling: solid fuels – CH_4

44. The inter-annual changes in the CH_4 IEF for underground mines have varied from –15.4 per cent to 24.3 per cent during 2007–2011. The NIR briefly describes that CH_4 emissions are estimated based on a report containing direct CH_4 concentration measurements at underground mining and explains the inter-annual changes in IEFs by the fluctuation of CH_4 concentration in coal. According to the previous review report, Kazakhstan provided the ERT with the results of the original research, including a deep investigation and analysis of the CH_4 content and IEFs specified for different mining fields. However, the recommendation in the previous review report to present this information in the NIR was not followed. Thus, the ERT reiterates the recommendation made in the previous review report that the Party include the background information about the measurements made and time series of the CH_4 concentration in the NIR.

45. The ERT noted that in the previous inventory submission, the CH_4 IEF for surface mines was 8.30 kg/t for the entire time series, whereas in the 2013 inventory submission the value reported for 2000 and 2002–2011 was 7.16 kg/t, and the value reported for 2001 was 5.88 kg/t. According to CRF table 8(b), recalculation was made due to new information received from coal mine owners. According to the NIR, the CH_4 content in the coal, based on the data from the main mining companies, varies between 6.76 and 7.56 kg/t. However, the ERT noted that this does not fully explain the use of the average EF of 7.16 kg/t applied for 2000 and 2002–2011, and, in particular, it does not explain the value used for 2001 (5.88 kg/t). In response to a follow-up question raised by the ERT during the review, Kazakhstan explained that information from the coal enterprises will be included in the next inventory submission. The ERT recommends that the Party include all relevant information about the calculation of the country-specific CH_4 EF in the NIR and ensure the consistency of the time series.

4. Non-key categories

Solid fuel transformation: solid fuels – CO_2 and CH_4

46. Following the recommendation made in the previous review report, Kazakhstan explained in the NIR that there are no data about solid fuel transformation activity in Kazakhstan except coal transformation occurring during the production of coke, which is included in the subcategory coke in the industrial processes sector. However, the ERT noted that in the NIR information on solid fuel transformation is reported, and AD for solid fuel transformation are reported in CRF table 1.B.1, while emissions for this category are reported as "NO". In response to a question raised by the ERT during the review, the Party explained that research was carried out on the possible processes leading to CO_2 and CH_4 emissions from transformation of coal in Kazakhstan, but no processes were identified other than coke production, which is reported in the industrial processes sector. The ERT considers that the response did not clarify which processes are included in the AD for solid fuel transformation reported in the CRF tables and why emissions are reported as "NO". The ERT also noted that there is no methodology in the Revised 1996 IPCC Guidelines or the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) for this category. The ERT recommends that Kazakhstan include in the NIR explanations of AD

reported for solid fuel transformation and encourages the Party to explore the possibilities of reporting emissions from this category. If the emissions from the activity are included elsewhere, the ERT recommends that the Party explain it in the NIR. The ERT also recommends that Kazakhstan ensure the correct use of notation keys and report the information in the documentation boxes in the CRF tables.

C. Industrial processes and solvent and other product use

1. Sector overview

47. In 2011, emissions from the industrial processes sector amounted to 17,159.66 Gg CO_2 eq, or 6.3 per cent of total GHG emissions, and emissions from the solvent and other product use sector were reported as "NE" and "NA" for the entire time series. Since 1990, emissions have decreased by 4.2 per cent in the industrial processes sector. The steep decrease in emissions in the early 1990s can be attributed to the country's economic crisis, owing to the disintegration of the Soviet Union in 1991. Since 1998, the emissions from industrial processes have had a generally increasing trend due to the improved economic situation in the country. The key driver in the steady increase in emissions from 1995 is the increasing production of mineral products and ferroalloys.

48. Within the industrial processes sector, in 2011, 62.1 per cent of the emissions were from metal production, followed by 31.2 per cent from mineral products and 4.9 per cent from consumption of halocarbons and SF_6. The remaining 1.8 per cent were from chemical industry.

49. The ERT noted a number of issues in the CRF tables related to the correct use of notation keys. For example, AD for soda ash production are reported as "NE", while the CO_2 emissions are reported as "NO" for the entire time series. In response to a question raised by the ERT during the review, Kazakhstan explained that there is no production of soda ash in the country and the correct notation key is "NO". In addition, AD for food and drink are reported as "IE" with a description "included in energy sector", while CO_2 emissions are reported as "NE". Furthermore, CO_2 emissions from glass production are reported using the notation key "IE" without specifying the category in which the emissions are included. In the NIR chapter on limestone and dolomite use, it is explained that the emissions are included in that category. The ERT recommends that Kazakhstan further strengthen its QA/QC processes to ensure correct use of notation keys and consistency of the information provided in the inventory submission, and report on this in the NIR. The ERT further recommends that the Party explain in CRF table 9(a) in which category the emissions reported as "IE" are included.

2. Key categories

<u>Cement production – CO_2</u>

50. The ERT commends Kazakhstan for providing detailed information about the methodology, AD and EF (including lime content of clinker and the cement kiln dust correction factors) used in the estimation of CO_2 emissions from cement production for 2011 in response to the recommendation made in the previous review report. As noted in the previous stages of the review, there are large inter-annual changes in the CO_2 IEF. The IEF changed from 0.50 to 0.59 t/t (18.1 per cent) between 2010 and 2011, which is the highest inter-annual change of all reporting Parties during these years. In response to a question raised during the previous stages of the review, Kazakhstan explained that this fluctuation is linked to the fluctuating calcium oxide content in clinker and the correction factor for cement kiln dust. In order to improve transparency, the ERT recommends that Kazakhstan provide the same detailed information about lime content in clinker and the

cement kiln dust correction factor for all the years in the time series as has been provided in the NIR for 2011.

Lime production – CO_2

51. The ERT noted that the CO_2 IEF has a generally decreasing trend from 0.78 t/t in 1993 to 0.74 t/t in 2011. The 2011 value is 3.6 per cent lower than the 1990 value and 2.7 per cent lower than the 2010 value. The NIR states that the IPCC default values for the quicklime/dolomitic lime ratio, correction for hydrated lime and EFs were used. It is not clear why the IEF is not constant if the same IPCC default values have been used over the entire time series. The ERT reiterates the recommendation made in the previous review reports that Kazakhstan provide more detailed information about the methodology used to estimate these emissions and revise the calculations, if appropriate.

Carbide production – CO_2

52. It was noted in the previous review report that the EF used for CO_2 from calcium carbide in 2010 (1.29 t/t) was below the theoretical minimum EF and recommendations in the previous review report included that the Party estimate emissions following the Revised 1996 IPCC Guidelines. In the 2013 inventory submission, the Party recalculated the 2010 emissions, and the resulting CO_2 IEF for the entire time series is 2.95 t/t, which corresponds to the default EF for calcium carbide in the Revised 1996 IPCC Guidelines, taking into account emissions from limestone use and reduction with coke, and those resulting from the use of the product, for example, when calcium carbide is used to produce acetylene. In response to a question raised by the ERT during the review, Kazakhstan explained that the quantity of acetylene produced from calcium carbide in Kazakhstan is not known, and that the calculations were made assuming that all calcium carbide is used for the production of acetylene. The Party further explained that the EF may be corrected in the future if information about exports of calcium carbide becomes available. The ERT recommends that Kazakhstan explore the use and potential imports or exports of calcium carbide and revise the EF, if necessary, following the methodology in the Revised 1996 IPCC Guidelines (volume 3, chapter 2.11.2).

Ferroalloys production – CO_2

53. The ERT commends Kazakhstan for providing information about the methodology, AD and EFs that were used for estimating CO_2 emissions from ferroalloys production, as included in recommendations made in the previous review report. However, the ERT noted that the AD provided in the NIR are an aggregated value of the total quantity of ferroalloys. The ERT recommends that Kazakhstan further improve transparency by providing the AD disaggregated by type of ferroalloy for the entire time series.

3. Non-key categories

Aluminium production – CO_2

54. Kazakhstan has reported CO_2 from aluminium production for 2007–2011. Emissions for 1990–2006 are reported as "NO", as the aluminium plant in Kazakhstan has been in operation since 2007. The ERT noted that Kazakhstan made recalculations for the CO_2 emission estimates from aluminium production only for 2008–2010. In response to a question raised by the ERT during the review, Kazakhstan explained that it has received new information about the use of pre-baked anodes from the only company producing aluminium in the country for the period 2008–2010, and that similar information for 2007 has not been received. The ERT considers that this may lead to inconsistency of the time series and recommends that Kazakhstan obtain detailed information about the use of pre-baked anodes for 2007 and recalculate the emissions for 2007.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

55. The ERT commends Kazakhstan for reporting, for the first time, HFC-32, HFC-125 and HFC-143a emissions from refrigeration and air-conditioning equipment for 2007–2011 in the 2013 inventory submission, consistent with recommendations made in the previous review report. The emissions are reported as "NO" for the rest of the time series. The ERT recommends that Kazakhstan provide a transparent explanation in the NIR to justify the choice of the notation key "NO", or collect AD and estimate these emissions for the entire time series.

56. The Party has not reported any numerical value or notation key for emissions from fire extinguishers (see table 3). In response to a question raised by the ERT during the review, Kazakhstan explained that information from the Ministry of Emergency Services shows that HFCs, PFCs and SF_6 are not used in fire extinguishers in the country. The ERT recommends that the Party use the notation key "NO" if the activity does not occur.

Electrical equipment – SF_6

57. Kazakhstan has reported SF_6 from electrical equipment for 2004–2009. The emissions for 1990–2003 and 2010–2011 are reported as "NO". The ERT also noted that the Party reported potential SF_6 emissions as "NO" for the entire time series. In response to a question raised during the previous stages of the review, the Party explained that the main consumer of SF_6 systematically refilled all circuit breakers in 2009, and according to the company data, it did not fill circuit breakers in 2010–2011. The ERT noted that the IPCC good practice guidance includes different methods to calculate SF_6 from electrical equipment, but none of them is based on refilled amount only. The ERT therefore recommends that the Party choose the appropriate method to estimate these emissions, based on the decision tree in figure 3.7 in chapter 3 of the IPCC good practice guidance and estimate the emissions accordingly.

D. Agriculture

1. Sector overview

58. In 2011, emissions from the agriculture sector amounted to 21,432.69 Gg CO_2 eq, or 7.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 43.8 per cent. The key drivers for the fall in emissions are a decrease in the livestock population, as well as a reduction in the application of synthetic fertilizers and in the area of cultivated lands caused by the country's economic crisis during the 1990s. Within the sector, in 2011, 59.1 per cent of the emissions were from enteric fermentation, followed by 21.1 per cent from agricultural soils and 19.3 per cent from manure management. The remaining 0.5 per cent were from rice cultivation.

59. Prescribed burning of savannas and field burning of agricultural residues are reported in the CRF tables using notation keys "NA" and "NO". According to the NIR, savannas do not occur in Kazakhstan and burning of agricultural residues has not been practised since the end of the 1980s. The ERT noted errors in the use of notation keys. For example, the prescribed burning of savannas is reported as "NA" instead of "NO", which is the correct notation key as the activity does not occur in Kazakhstan. In addition, in CRF table 4.F the correct notation key for AD and the parameters for field burning of agricultural residues would be "NA" instead of "NE". In addition, inconsistencies between the CRF tables and the NIR, as well as between the data reported across the CRF tables, remain (see para. 67 below). The ERT reiterates the recommendation made in the previous review report that Kazakhstan correct the errors in the NIR and the CRF tables.

60. In the 2013 inventory submission Kazakhstan has reported, for the first time, CH_4 emissions from enteric fermentation and CH_4 and N_2O emissions from manure management of mules and asses and buffalos. The ERT acknowledges the efforts made by Kazakhstan to complete the inventory for the agriculture sector and recommends that the Party continue to improve completeness (see para. 72 below).

61. The reporting of the inventory is not fully transparent for the agriculture sector. The NIR provides very limited information on the references and sources of AD, EFs and other relevant parameters involved in the calculations of CH_4 and N_2O emissions. In addition, methodologies and assumptions for the selection of EFs and parameters are not sufficiently provided in the NIR. The ERT reiterates the recommendations made in the previous review report that the Party improve the transparency of the reporting by providing all supporting information on methodologies, AD, EFs and parameters in the NIR and the CRF tables as required by the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the UNFCCC reporting guidelines.

62. A tier 1 method was applied for the uncertainty analysis of the sector; however, the NIR does not provide supporting information on the sources and references of uncertainty values for AD and EFs, in particular for calculations of uncertainties for categories where country-specific EFs, AD and parameters are used. Therefore, the ERT reiterates the recommendation made in the previous review report that Kazakhstan provide the sources and references for the uncertainty values used in the analysis of the agriculture sector.

2. Key categories

Enteric fermentation – CH_4

63. In the 2013 inventory submission, Kazakhstan has reported goats and sheep separately using a combination of available data on livestock population from national statistics and from the Food and Agriculture Organization of the United Nations (FAO), following the recommendation made in the previous review report. The ERT welcomes this improvement.

64. Kazakhstan recalculated CH_4 emissions from enteric fermentation of sheep, goats and swine and applied default IPCC EFs for developing countries for sheep and swine, which are lower than those for developed countries used in the previous inventory submission. It is explained in the NIR that the default values which are most appropriate to local conditions were used. It was further explained in the NIR that the EF for sheep was recalculated as the weight of the animals was found to be lower than had been assumed. However, the NIR does not provide any related evidence, such as weight data. The ERT recommends that Kazakhstan improve the transparency of the reporting in the NIR by providing all supporting information on the assumptions made for the selection of the EFs.

65. The ERT noted that based on the explanation provided in the NIR on calculations of country-specific CH_4 EFs, the activity coefficient corresponding to the animals' feeding situation (C_a) for cattle is taken into account in the calculations incorrectly. According to the NIR (table 6.15), the C_a value used for dairy cattle corresponds to the IPCC good practice guidance default C_a for stall and the C_a used for non-dairy cattle corresponds to the default value for pasture. Based on the data provided in the NIR and the CRF tables, cattle spend a defined time grazing and the remaining time is spent in the stall. Therefore, it is good practice to adjust the default C_a value accordingly. In addition, the ERT noted that in the calculation of the estimates of feed intake Kazakhstan did not take into account the net energy needed by young animals for growth. The ERT reiterates the recommendation made in the previous review report that Kazakhstan revise the feed intake estimates for cattle, providing accurate estimates for this category according to the IPCC good practice

guidance, and provide all supporting data and parameters used for the calculations in the NIR and the CRF tables in order to improve the transparency of the reporting.

Manure management – CH_4 and N_2O

66. Kazakhstan has applied the IPCC tier 1 method and default EFs for the cool climatic conditions of Eastern Europe for the estimation of CH_4 emissions from manure management for all animals, which is in line with the IPCC good practice guidance. Taking into account that Kazakhstan used feed intake estimates to calculate country-specific EFs for enteric fermentation of dairy and non-dairy cattle, the ERT encourages the Party to estimate CH_4 emissions from manure management using higher-tier methods and country-specific EFs for significant animal species using consistent data on feed intake estimates for the categories of enteric fermentation and manure management.

67. The ERT noted that there are inconsistencies in the data on allocation of manure per animal waste management system (AWMS) in the CRF tables. For example, data on the allocation of AWMS for buffalo in CRF table 4.B(a) are reported as "NO", whereas in CRF table 4.B(b) it is reported that buffalo manure is managed in solid storage and dry lot. In addition, data on allocation of AWMS are based on expert judgement, but the NIR does not provide any of the assumptions which were made for the derivation of the fractions of manure per AWMS. In response to a question raised by the ERT during the review, Kazakhstan explained that data on manure deposits for different AWMS were calculated based on the data on pasture and stall periods for different animals. The ERT reiterates the recommendation made in the previous review report that Kazakhstan improve the consistency of the reporting of the same data between the different CRF tables. The ERT also recommends that the Party improve the transparency of the reporting by providing all supporting information for AD and relevant parameters in the NIR and the CRF tables.

Direct soil emissions – N_2O

68. Kazakhstan uses a combination of the IPCC tier 1a and 1b methods and a default EF (0.01 kg N_2O-N/kg nitrogen (N)) from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) to estimate direct N_2O emissions from agricultural soils. The EF used is lower than the default EF (0.0125 kg N_2O-N/kg N) in the IPCC good practice guidance. The NIR does not provide any justification for the use of the EF from the 2006 IPCC Guidelines and how it better corresponds to the national conditions than that presented in the IPCC good practice guidance. Therefore, the ERT reiterates the recommendation made in the previous review report that Kazakhstan provide a justification for the use of the default EF from the 2006 IPCC Guidelines in the NIR.

69. Kazakhstan uses the IPCC tier 1b method for the estimation of N_2O emissions from crop residues including legumes. The values for the fraction of crop and roots residues applied to soils and for dry matter in crops, as well as the N content in roots and stubble, are country-specific. The ERT noted that Kazakhstan uses the same methodology for the estimation of emissions from N fixation and separately reports only N_2O emissions from residues of legumes in the N-fixing crops category in the CRF tables. Considering that Kazakhstan accounts for roots in the estimation of N_2O emissions from crop residues and that N fixed by the N-fixing bacteria is accumulated in the roots of legumes, the ERT concludes that this approach excludes double counting of N_2O emissions from the agriculture sector. However, to improve transparency, the ERT recommends that the Party provide more thorough information on the methodologies and parameters used for the estimation of N_2O emissions from N-fixing crops and crop residue subcategories in the NIR and the CRF tables.

Pasture, range and paddock manure – N_2O

70. Kazakhstan reported in CRF table 4.D that the fraction of livestock N excreted and deposited onto soil during grazing was 0.52 in 1990 and 0.61 in 2011. However, the ERT noted that based on the data on total amount of manure deposited in the different AWMS provided in CRF table 4.B(b), the fraction of manure excreted on pasture, range and paddock is 0.59 in 1990 and 0.58 in 2011. The ERT therefore reiterates the recommendation made in the previous review reports that Kazakhstan correctly report the fraction of manure excreted on pasture (0.59 in 1990 and 0.58 in 2011) in CRF table 4.D.

Indirect emissions – N_2O

71. In the previous review report, the ERT concluded that there was double counting of indirect N_2O emissions from atmospheric deposition. The present ERT noted that the approach for the estimation of direct N_2O emissions from the application of mineral and organic fertilizers described in the NIR (formula 6.1 p.177) takes into account the values of N volatized in forms of ammonia (NH_3) and nitrogen oxides (NO_X) and the ERT concluded that no double counting occurs. The values used for the N fractions that volatize as NH_3 and NO_X are 0.1 for the application of synthetic fertilizers and 0.2 for manure applied to soils. These fractions are consistent with the data used for calculations of indirect soils emissions. However, the ERT considers that the parameters involved in the calculation of emissions from agricultural soils are not sufficiently explained in the NIR and recommends that the Party improve the transparency of the reporting by providing all supporting information used for the estimation of emissions from agricultural soils.

72. In the 2013 inventory submission Kazakhstan reported indirect N_2O emissions from leaching and run-off as "NE" in the CRF tables with an explanation that there are no objective and regular data on crop areas affected by leaching. However, the ERT noted that, according to the methodology described in the IPCC good practice guidance for the estimation of N_2O emissions from leaching and run-off, the only country-specific data needed are related to the application of mineral fertilizers and manure onto soils, whereas for the other parameters, IPCC defaults are available. The ERT noted that the country-specific data needed are available from national statistics and are used by the Party for the calculation of direct N_2O emissions from soils. Therefore, the ERT strongly reiterates the recommendation made in the previous review report that Kazakhstan follow the IPCC good practice guidance and the Revised 1996 IPCC Guidelines and estimate indirect N_2O emissions from leaching and run-off using the readily available AD to improve completeness.

Other (agricultural soils) – N_2O

73. The ERT noted that in the previous inventory submission, Kazakhstan estimated N_2O emissions from soils mineralization and reported the emissions in the subcategory other (agricultural soils). In the 2013 inventory submission, the notation key "NE" is used with an explanation that for more accurate results, additional materials and field studies are needed. However, the results of the emission estimates are shown in the NIR as a reference. The ERT noted that N_2O emissions from soils mineralization is not a mandatory reporting category in the agriculture sector and, according to the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF), the process of mineralization in soils due to changes in the land use and management practices are considered in the LULUCF sector. The ERT recommends that Kazakhstan conduct further research to obtain verifiable data for the estimation of N_2O emissions from mineralization of soils and report these emissions in the land converted to cropland category in the LULUCF sector.

E. Land use, land-use change and forestry

1. Sector overview

74. In 2011, net removals from the LULUCF sector amounted to 3,093.61 Gg CO_2 eq. Since 1990, net removals have increased by 42.8 per cent. The key driver for the rise in removals is an increase in carbon accumulation in living biomass in forest land remaining forest land. In 2011, 3,214.61 Gg CO_2 eq of net removals were from forest land. Net emissions from grassland were 121.00 Gg CO_2 eq. Net CO_2 emissions from cropland, wetlands and settlements, CH_4 and N_2O emissions from grassland and settlements, and N_2O emissions from cropland were reported as "NE", "NO". CH_4 emissions from cropland and CH_4 and N_2O emissions from wetlands were reported as "NO".

75. In the 2012 inventory submission, Kazakhstan reported land-use matrices for 1990–2010, and the ERT recommended that the Party improve the consistency of its reporting for land representation and report the improved data in the 2013 inventory submission. Kazakhstan did not include any land-use change matrices in the 2013 inventory submission. The ERT considers that the absence of the matrices decreases the quality and transparency of the inventory for the LULUCF sector. In response to a question raised by the ERT during the review, Kazakhstan explained that due to the reorganization of the Agency for Land Resources Management to the newly established Ministry of Regional Development, Kazakhstan did not receive initial data for the annual land-use change matrices for 1990–2011. In addition, Kazakhstan explained that it will make efforts to obtain these matrices for the preparation of the next inventory submission. The ERT strongly recommends that Kazakhstan develop annual land-use change matrices and improve land representation according to the IPCC good practice guidance for LULUCF, as included in recommendations made in the previous review report. The ERT also reiterates the recommendation made in the previous review report that Kazakhstan make efforts to convert existing statistics into the IPCC land-use categories, taking into consideration, among other issues, that:

(a) Even if a land use results in no emissions, it is good practice to report its area and use appropriate notation keys for net emissions and IEFs;

(b) Where relevant, forest land, grassland, wetlands and other land should be divided into "managed" and "unmanaged". Although net emissions of unmanaged lands do not need to be reported, reporting the area would allow the consistency of data to be transparently justified;

(c) The definitions of land-use categories in the IPCC good practice guidance for LULUCF are rather flexible, and this should facilitate the use of available statistics, with the help of proxy data, expert judgement and justified assumptions, which should be documented in the NIR;

(d) Lands that do not change land use should be reported separately from lands with land-use conversion;

(e) Kazakhstan may choose to report aggregated estimates for all land conversions to a particular land use, when data are not available to report them separately. This should be clearly stated in the documentation boxes and documented in the NIR;

(f) The category other land remaining other land is intended to allow the total reported land area to match the total area of the country.

76. According to the data provided in table 7.8 of the NIR, the area of forests and shrubs decreased from 12,650.7 kha in 2003 to 12,274.2 kha in 2008. It indicates average annual deforestation of 75.3 kha during this period. However, in the CRF tables, the Party has reported the area of forest land converted to other land-use categories as "NO". Also, the

changes in carbon stocks in forest land converted to other land-use categories are reported as "NO" except for dead organic matter and mineral soils for forest land converted to grassland (reported as "NE"). The ERT considers that there is an underestimation of emissions from conversion of forest land to other land-use categories. The ERT recommends that the Party report areas of conversion from forest land to other land-use categories in land-use change matrices and provide estimations of GHGs from deforestation in appropriate subcategories.

77. In the 2013 inventory submission, uncertainties were reported separately for forest land remaining forest land, cropland remaining cropland and grassland remaining grassland, and for the LULUCF sector as a whole. The uncertainty estimates were based mainly on expert judgement and were not verified against information from independent sources. Although the NIR included a section on uncertainties, it was limited to basic information on the errors associated with different parameters in the national forest inventory and to the reproduction of default values given in the IPCC good practice guidance for LULUCF. The ERT reiterates the recommendation made in the previous review report that Kazakhstan provide a complete set of uncertainty estimates for carbon stock changes and other emissions covering all mandatory categories, using country-specific values, where possible.

78. The ERT noted that specific QA/QC procedures have not been implemented by Kazakhstan in its 2013 inventory submission for the LULUCF sector. The ERT identified some inconsistencies in the reporting; for example, inconsistencies in the land areas of forest land remaining forest land in 2011 reported in the NIR (14,350.1 kha) and the CRF tables (14,330.2 kha) for 2011. The ERT considers that this could be avoided by applying appropriate QC procedures. The ERT therefore reiterates the recommendation made in the previous review reports that Kazakhstan implement its QA/QC plan for the sector in accordance with the IPCC good practice guidance for LULUCF. Further, the ERT encourages Kazakhstan to consider the implementation of any available tools, including software tools if appropriate, for performing inventory calculations and QC procedures for the LULUCF sector. This would improve the consistency in the representation of land use and minimize the risks of errors in data processing and reporting.

2. Key categories

Forest land remaining forest land – CO_2

79. Kazakhstan reported in the CRF tables and the NIR a time series of the areas of forest land remaining forest land. These data are significantly different from the data reported to FAO.[3] The ERT noted, for example, that Kazakhstan reported to FAO the following areas of forest land (including forests and other wooded lands): for 1990, 16,471 kha; for 2000, 18,130 kha; and for 2005, 18,959 kha. In the CRF tables the Party reported the following areas of forest land: for 1990, 14,302.80 kha; for 2000, 14,232.00 kha; and for 2005, 14,326.00 kha. The NIR does not provide any explanation of these differences. In response to a question raised by the ERT during the review, Kazakhstan stated that this question will be addressed to the Committee for Forestry and Hunting of MoEP. The ERT encourages Kazakhstan to explain these differences in its NIR and improve, as far as is possible, the consistency of the data on forest land used for reporting to the UNFCCC secretariat and to FAO.

80. Carbon stock changes in forest land remaining forest land were estimated using a tier 2 method and data from the national forest inventory. Carbon stock changes in living biomass were estimated by the stock change method. Net carbon stock changes in dead

[3] <http://www.fao.org/forestry/country/32185/en/kaz/>.

organic matter were reported as "IE" and it was explained in chapter 7.4.1 of the NIR and the CRF comment box that the estimates were included in carbon stock changes in living biomass. Net carbon stock changes in mineral soils were reported as "NE". The ERT reiterates the recommendation made in the previous review report that Kazakhstan report carbon stock changes separately for all the pools of this category.

81. According to the NIR, areas of forest land include forest (about 20 per cent of forest land) and other wooded land. The ERT noted that these subcategories of forest land differ significantly in their carbon stocks of living biomass, dead wood, litter and soil. In order to improve the transparency of the inventory submission, the ERT encourages Kazakhstan to subdivide forest land into two subcategories (e.g. forests and other wooded areas) and report carbon stock changes separately for these subcategories.

3. Non-key categories

Cropland remaining cropland – CO_2

82. Kazakhstan has reported in the NIR (table 7.6) significant areas of abandoned land for the period 1992–2011 as cropland (10,974.00 kha in 2011). According to the definition in the IPCC good practice guidance for LULUCF, the ERT considers that these areas are not cropland and may be allocated to cropland converted to grassland or cropland converted to other land. Also, abandoned lands usually have higher levels of carbon stock per area in comparison with cropland. The ERT reiterates the recommendation made in the previous review report that Kazakhstan exclude abandoned lands from cropland and report this category under cropland converted to grassland or cropland converted to other land in order to improve the accuracy and transparency.

83. The ERT noted that Kazakhstan reported in the NIR significant net CO_2 emissions from mineral soils in cropland remaining cropland ranging from 20,908 Gg CO_2 in 1990 to 49,803 Gg CO_2 in 2011. In the CRF tables, net carbon stock changes in soils for the category were reported using the notation key "NE". Emissions presented in the NIR correspond to arable lands. Kazakhstan provided information in the NIR that CO_2 emissions from soils of arable land were preliminary estimates using the data from the national soil monitoring conducted by Kazakhstan's scientific centre, Agrokhimsluzhba, in 1989 and 2000–2010. However, due to the fact that there is high uncertainty in the calculation of these emissions, Kazakhstan did not include these data in the CRF tables. In response to a question raised by the ERT during the previous review, the Party had informed the ERT that after verification of emission calculations they will be included in the 2013 inventory submission. The present ERT noted that this has not been done. The ERT reiterates the recommendation made in the previous review report that Kazakhstan apply the necessary procedures for the verification of emissions from soils, including any procedures in accordance with the QA/QC plan, and include these emissions in the CRF tables.

Grassland remaining grassland – CO_2

84. For grassland remaining grassland Kazakhstan reported values only for carbon stock change in living biomass. Net carbon stock change in dead organic matter and in mineral soils was reported as "NE", and net carbon stock change in organic soils was reported as "NO". To calculate carbon stock change in living biomass Kazakhstan used an average value of net primary production and the areas of grassland with different degrees of degradation. Kazakhstan applied the same ratio of grassland to grassland under different types of degradation for the entire time series. However, the ERT considers that the degree of grassland degradation may have changed considerably due to changes in the livestock population since 1990. The ERT reiterates the recommendation made in the previous review report that Kazakhstan check the reliability of the AD for the degree of grassland degradation for the entire time series.

85. Kazakhstan has reported in NIR tables 7.4 and 7.5 and CRF table 5.C constant areas of grassland (187,242.00 kha) for the entire time series. The ERT noted that according to NIR table 7.1, the area of grassland in 2010 was 193,535.8 kha. The ERT reiterates the recommendation made in the previous review report that Kazakhstan implement the procedures included in its QA/QC plan in order to improve both the consistency and the accuracy of the reporting.

Land converted to grassland – CO_2

86. Kazakhstan reported information on conversion of forest land to grassland in the NIR (pages 208 and 233). However, for 1990–2011 in CRF table 5.C, Kazakhstan reported area, carbon stock change in living biomass and net carbon stock change in organic soils as "NO" and net carbon stock change in dead organic matter and in mineral soils as "NE" for forest land converted to grassland. The ERT noted that this might imply an underestimation of emissions from this category owing to deforestation (see para. 76 above). The ERT reiterates the recommendation made in the previous review report that Kazakhstan include AD in the CRF tables and estimate carbon stock changes in all pools. In addition, in order to improve transparency, the ERT encourages Kazakhstan to subdivide forest land converted to grassland into two subcategories, such as forests and other wooded areas converted to grassland with different carbon stock changes per area in all pools (see also para. 81 above), and report carbon stock changes separately for these subcategories.

Biomass burning – CO_2, CH_4 and N_2O

87. The ERT noted that Kazakhstan reported controlled burning in grassland remaining grassland and controlled burning and wildfires in land converted to grassland as "NO" and wildfires in grassland remaining grassland as "NE". The ERT noted that an independent source[4] provides information regarding burned areas of grassland (2.6 to 4.7 million ha/year for the period 2002–2006) for Kazakhstan. Therefore, the ERT considers that data on wildfires on grassland could be collected from different sources for the entire time series 1990–2011 and used for the inventory preparation. The ERT therefore reiterates the recommendation made in the previous review report that Kazakhstan collect AD and report emissions from wildfires on grassland.

88. The ERT noted that Kazakhstan reported biomass burning in wetlands using the notation key "NO". The ERT further noted that the independent source mentioned in the previous paragraph also provides information about burned areas of wetlands (2.6 to 4.7 thousand ha/year for the period 2002–2006) for Kazakhstan. Therefore, the ERT considers that remote data on wildfires on wetlands could be collected from different sources for the entire time series 1990–2011 and used for the inventory preparation. The ERT therefore reiterates the recommendation made in the previous review report that Kazakhstan collect AD and report emissions from wildfires on land converted to wetlands, and encourages the Party to estimate and report these emissions also for wetlands remaining wetlands.

F. Waste

1. Sector overview

89. In 2011, emissions from the waste sector amounted to 4,065.56 Gg CO_2 eq, or 1.5 per cent of total GHG emissions. Since 1990, emissions have increased by 48.4 per cent. The key driver for the rise in emissions is an increase in waste generation per capita

[4] Remote sensing observations by the Space Research Institute of the Russian Academy of Science, available at <http://terranorte.iki.rssi.ru>.

from 0.90 to 1.30 kg/cap/day. Within the sector, in 2011, 87.9 per cent of the emissions were from solid waste disposal on land, followed by 12.0 per cent from wastewater handling. The remaining 0.1 per cent was from waste incineration.

2. Key categories

Solid waste disposal on land – CH_4

90. The ERT noted that Kazakhstan reported emissions from municipal waste disposal, but the NIR does not contain any information on industrial waste management. In response to a question raised by the ERT during the review, the Party explained that industrial waste is not deposited on solid waste disposal sites (SWDS) in Kazakhstan. The ERT recommends that Kazakhstan provide a justification, based on statistical data that confirms how industrial waste is treated and disposed, and estimate and report the emissions from industrial waste, if applicable.

91. Kazakhstan uses a constant value of 0.21 for degradable organic carbon (DOC) for the time series 1990–2011. The ERT noted that usually the waste composition changes over time due to changes in consumption patterns. In response to a question raised by the ERT during the review, Kazakhstan explained that very few studies of the morphological composition of municipal solid waste (MSW) disposal at SWDS are available in Kazakhstan and that this issue will be further improved in the next inventory submission. The ERT recommends that Kazakhstan continue its country-specific studies or use relevant DOC values from a country with similar economic and geographical conditions as a reference, and recalculate the emissions based on updated DOC values for 1990–2011.

92. The ERT identified some inconsistencies between the reporting in the NIR and the CRF tables. For example, in 2011, the AD (annual MSW at the SWDS) for shallow unmanaged waste disposal sites is reported as 3,572.44 Gg, whereas the total for unmanaged waste disposal sites is reported as 3,184.49 Gg (the same value as for managed waste disposal on land) in CRF table 6.A; a methane correction factor value of 0.6 is reported for the unmanaged waste disposal sites in CRF table 6.A, but in the NIR a value of 0.4 is reported. In response to a question raised by the ERT during the review, the Party explained that the inconsistencies between the NIR and the CRF tables are due to the use of the first-order decay method in the 2013 inventory submission for the first time. The ERT recommends that the Party correct the erroneous values and enhance the QC procedures to avoid such errors.

3. Non-key categories

Wastewater handling – CH_4

93. The ERT noted that in the previous inventory submission, the share of aerobic wastewater treatment was indicated as 90.0 per cent for industrial wastewater for all years and for domestic and commercial wastewater for 1990–2009 in CRF table 6.B, whereas for domestic wastewater in 2010, the shares of all handling systems were reported as zero. According to the NIR of the 2013 inventory submission, all wastewater is handled in aerobic treatment facilities. Consequently, the CH_4 emissions from wastewater treatment are reported as "NA", "NO". During the review the ERT requested Kazakhstan to provide an explanation on the approach used, as well as the information about the population connected to the central water supply and wastewater treatment systems. In response to the question, Kazakhstan explained that this issue will be investigated for the next inventory submission. The ERT recommends that Kazakhstan collect available statistical data to increase the accuracy and transparency of its reporting and provide more detailed information in the NIR on the parameters used, justifying the approach taken.

Waste incineration – CO_2

94. Kazakhstan recalculated the CO_2 emissions from medical waste incineration, following a recommendation made in the 2011 annual review report. The AD on medical waste incineration have been corrected to take into account only waste containing fossil carbon, which led to a decease in the CO_2 emissions. The ERT commends Kazakhstan for its efforts.

III. Conclusions and recommendations

A. Conclusions

95. Table 6 summarizes the ERT's conclusions on the 2013 inventory submission of Kazakhstan, in accordance with the UNFCCC review guidelines.

Table 6
Expert review team's conclusions on the 2013 inventory submission of Kazakhstan

		Cross-references, if applicable
The ERT concludes that the inventory submission of Kazakhstan is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Non-land use, land-use change and forestry[a]	Not complete	Table 3
Land use, land-use change and forestry[a]	Not complete	Table 3
The ERT concludes that the inventory submission of Kazakhstan has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	36–38
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	No	42, 57, 65, 82
The institutional arrangements continue to perform their required functions	Yes	

Abbreviations: CRF = common reporting format, IPCC = Intergovernmental Panel on Climate Change, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the IPCC *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

96. The ERT identified the issues for improvement listed in table 7. All recommendations are for the next inventory submission, unless otherwise specified.

Table 7
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Cross-cutting	Completeness	Improve completeness by including estimates for all mandatory categories	Table 3
		Use notation key "NO" if activity is not occurring and "IE" if emissions are included elsewhere	Table 3
	Recalculations	Report transparently on all recalculations	Table 3
	QA/QC	Strengthen QA/QC activities, implement the QA/QC plan and provide more information in the NIR on the category-specific QA/QC procedures	Table 3
	Transparency	Improve transparency by bringing the structure of the NIR into full accordance with the UNFCCC reporting guidelines; provide a list of recommendations from the previous review report with an indication of performed improvements; and provide a list of planned improvements with timelines in the NIR	Table 3
	QA/QC	Include in the NIR the clarification provided to the ERT regarding QA/QC activities	12
	Key category analysis	Ensure consistency of reporting in the NIR and the CRF tables and follow the level of disaggregation described in chapter 5.4 of the IPCC good practice guidance for LULUCF	Table 4
		Include in the NIR the information on whether the key category analysis is used to prioritize the development and improvement of the inventory	Table 4
	Uncertainty analysis	Review the uncertainty estimates and ensure that the estimates are performed according to the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Table 4
	Inventory management	Provide more information on the archiving system and the information included and how this system is maintained by KazNIIEK	15
	Follow-up to previous reviews	Implement pending recommendations from the previous review report	17
Energy	Sector overview	Minimize the difference in sectoral and reference approaches by improving the data collection for statistics, by applying appropriately documented expert estimates or by using statistical calculation tools	21

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Use in the CRF tables the notation key "IE" instead of "NO" or "NA" in cases in which emissions are included elsewhere, and include appropriate explanations in CRF table 9(a) and the NIR	22
		Report in the NIR all information regarding the reasons for recalculations and the methodologies used for the recalculated categories, to improve transparency	23
		Include the information justifying the country-specific EFs in the NIR	25
		Include detailed data on energy consumption by fuel for all subcategories in the energy sector	26
		Investigate the possibility of separating combusted fuels from other losses, including feedstocks and non-energy use of fuels, and report related emissions in the appropriate categories of the energy sector (emissions from fuel combustion or fugitive emissions) or, as appropriate, in other inventory sectors	27
		Explain the underlying assumptions and the degree of expert judgement used in interpolation, ensure the consistency of the entire time series and provide comparisons of AD obtained from different sources	28
		Include the description of QA/QC procedures applied for transport and fugitive emissions	29
	Comparison of the reference approach with the sectoral approach and international statistics	Include information on apparent energy consumption (excluding non-energy use and feedstocks) in CRF table 1.A(c)	31
		Cross-check the AD and provide explanations of the differences in inter-annual changes between the reference and sectoral approaches	33
		Separate coking coal consumption from the total other bituminous coal consumption	34
		Reduce the discrepancies between the energy consumption data reported in the inventory submission and the data reported to IEA and provide explanations in the NIR	35
	International bunker fuels	Obtain relevant navigation statistics, correctly allocate fuel consumption to international and domestic navigation, and use the appropriate EFs for reporting emissions	37

Sector	*Category*	*Recommendation*	*Paragraph reference*
	Feedstocks and non-energy use of fuels	Check the CSFs used and recalculate carbon stored, if appropriate, or provide a justification regarding the applicability of the Russian CSFs values	38
	Stationary combustion: solid fuels – CO_2	Investigate the possibility of calculating country-specific CO_2 EFs for lignite and sub-bituminous coal	39
		Investigate the allocation of AD and emissions from the energy sector to the industrial processes sector and correct any misallocations, and provide a carbon balance for the iron and steel production and the non-ferrous metals industries in the NIR	40
	Stationary combustion: gaseous fuels – CO_2	Investigate the reasons for the low CO_2 IEF for energy industries and provide sufficient and well-documented explanations	41
	Road transportation: liquid fuels – CO_2 and N_2O	Reallocate AD and emissions from transportation in agriculture/forestry/fisheries to the subcategory agriculture/forestry/fisheries and emissions from industrial and construction off-road transport to the category manufacturing industries and construction	42
		Improve the accuracy of the N_2O emission estimates by taking into account the pollution control technologies introduced over time in the vehicle fleet	43
	Coal mining and handling: solid fuels – CH_4	Include in the NIR the background information about the measurements made and time series of the methane concentration	44
		Include all relevant information about the country-specific CH_4 EF calculation and ensure the consistency of the time series	45
	Solid fuel transformation: solid fuels – CO_2 and CH_4	Provide explanations of AD reported for solid fuel transformation and ensure the correct use of notation keys and report information in the documentation boxes in the CRF tables	46
Industrial processes and solvent and other product use	Sector overview	Strengthen the QA/QC processes to ensure correct use of notation keys and consistency of the information provided in the inventory submission, and report on this in the NIR	49
		Explain in CRF table 9(a) in which category the emissions reported as "IE" are included	
	Cement production – CO_2	Provide detailed information about lime content in clinker and the cement kiln dust correction factor for the entire time series	50
	Lime production	Provide more detailed information about the methodology used to estimate the emissions and revise	51

Sector	*Category*	*Recommendation*	*Paragraph reference*
	– CO_2	the calculations, if appropriate	
	Carbide production – CO_2	Explore the use and potential imports or exports of calcium carbide and revise the EF used, if necessary	52
	Ferroalloys production – CO_2	Provide the AD of ferroalloys, disaggregated by type of ferroalloy for the entire time series	53
	Aluminium production – CO_2	Obtain detailed information about the use of pre-baked anodes for 2007 and recalculate the emissions for 2007	54
	Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6	Provide a transparent explanation in the NIR to justify the choice of the notation key "NO" for years prior to 2007, or collect AD and estimate emissions of HFC-32, HFC-125 and HFC-143a from refrigeration and air-conditioning equipment for the entire time series	55
		Use the notation key "NO" for categories which do not occur in the country	56
	Electrical equipment – SF_6	Choose the appropriate method to estimate SF_6 emissions from electrical equipment and estimate the emissions	57
Agriculture	Sector overview	Correct the errors and inconsistencies in the NIR and the CRF tables	59
		Provide all supporting information on methodologies, AD, EFs and parameters in the NIR and the CRF tables	61
		Provide the sources and references for the uncertainty values used in the analysis of the agriculture sector	62
	Enteric fermentation – CH_4	Provide all supporting information on the assumptions made for the selection of EFs for sheep and swine	64
		Revise the feed intake estimates for cattle and provide all supporting data and parameters used for the calculations in the NIR and the CRF tables	65
	Manure management – CH_4 and N_2O	Improve the consistency of the reporting of the AD between the different CRF tables and provide all supporting information for AD and relevant parameters in the NIR and the CRF tables	67
	Direct soil emissions – N_2O	Provide a justification for the use of the default EF from the 2006 IPCC Guidelines	68
		Provide more thorough information on the methodologies and parameters used for the estimation of N_2O emissions from N-fixing crops and crop residue subcategories in the NIR and the CRF tables	69
	Pasture, range and paddock manure – N_2O	Correctly report the fraction of manure excreted on pasture in CRF table 4.D	70
	Indirect	Provide all supporting information used for the	71

Sector	*Category*	*Recommendation*	*Paragraph reference*
	emissions – N_2O	estimation of emissions from agricultural soils	
		Estimate indirect N_2O emissions from leaching and run-off using the readily available AD	72
	Other (agricultural soils) – N_2O	Conduct further research to obtain verifiable data for the estimation of N_2O emissions from mineralization of soils and report these emissions in the land converted to cropland category in the LULUCF sector	73
LULUCF	Sector overview	Develop annual land-use change matrices and improve land representation according to the IPCC good practice guidance for LULUCF and make efforts to convert existing statistics into the IPCC land-use categories	75
		Report areas of conversion from forest land to other land-use categories in land-use change matrices and provide estimations of GHGs from deforestation in appropriate subcategories	76
		Provide a complete set of uncertainty estimates for carbon stock changes and other emissions covering all mandatory categories, using country-specific values, where possible	77
		Implement the QA/QC plan for the sector in accordance with the IPCC good practice guidance for LULUCF	78
	Forest land remaining forest land – CO_2	Report carbon stock changes separately for all the pools	80
	Cropland remaining cropland – CO_2	Exclude abandoned lands from cropland and report this category under cropland converted to grassland or cropland converted to other land	82
		Apply the necessary procedures for the verification of emissions from soils, including any procedures in accordance with the QA/QC plan, and include these emissions in the CRF tables	83
	Grassland remaining grassland – CO_2	Check the reliability of the AD for the degree of grassland degradation for the entire time series	84
		Implement the procedures in the QA/QC plan	85
	Land converted to grassland – CO_2	Include AD in the CRF tables and estimate carbon stock changes in all pools	86
	Biomass burning – CO_2, CH_4 and N_2O	Collect AD and report emissions from wildfires on grassland and land converted to wetlands	87–88
Waste	Solid waste disposal on land – CH_4	Provide a justification, based on statistical data, that confirms how industrial waste is treated and disposed, and estimate and report the emissions from industrial	90

Sector	*Category*	*Recommendation*	*Paragraph reference*
		waste, if applicable	
		Continue the country-specific studies or use DOC values from a country with similar economic and geographical conditions as a reference and recalculate the emissions for 1990–2011	91
		Correct the erroneous values and inconsistencies between the NIR and the CRF tables and enhance the QC procedures to avoid such errors	92
	Wastewater handling – CH_4	Collect available statistical data and provide more detailed information on the parameters used, justifying the approach taken	93

Abbreviations: AD = activity data, CRF = common reporting format, CSF = fraction of carbon stored, DOC = degradable organic carbon, EF = emission factor, ERT = expert review team, GHGs = greenhouse gases, IE = included elsewhere, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KazNIIEK = Kazakh Scientific Research Institute of Ecology and Climate, LULUCF = land use, land-use change and forestry, N = nitrogen, NA = not applicable, NIR = national inventory report, NO = not occurring, QA = quality assurance, QC = quality control, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", 2006 IPCC Guidelines = *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

Annex I

Background data on recalculations

Table 8
Recalculations in the 2013 inventory submission for the base year and the most recent year

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
1. Energy	443.77	28 544.72	0.1	13.2	Improved AD and EFs
A. Fuel combustion (sectoral approach)	443.77	30 911.34	0.2	17.0	
1. Energy industries	0.07	2 365.17	0.0	2.5	
2. Manufacturing industries and construction		–149.21		–0.6	
3. Transport	443.70		2.0		
4. Other sectors		–1 948.40		–11.6	
5. Other		30 643.78		119.6	
B. Fugitive emissions from fuels		–2 366.62		–6.8	
1. Solid fuels		–2 366.62		–9.5	
2. Oil and natural gas					
2. Industrial processes		543.23		3.7	Improved AD and EFs
A. Mineral products					
B. Chemical industry		59.23		28.2	
C. Metal production		101.62		1.0	
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6		382.37		84.0	
G. Other					
3. Solvent and other product use					
4. Agriculture	–394.13	–4 961.36	–1.0	–18.2	Improved AD EFs and parameters
A. Enteric fermentation	–449.03	96.81	–2.1	0.7	
B. Manure management	4 224.52	–318.27	140.4	–6.8	
C. Rice cultivation					
D. Agricultural soils	–4 169.62	–4 739.90	–30.8	–52.4	
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					
5. Land use, land-use change and forestry	–2 184.71	3 142.33	–12 028.1	–52.1	Improved AD and change in method

Greenhouse gas source and sink categories	1990	2010	1990	2010	Reason for the recalculation
	Value of recalculation (Gg CO_2 eq)		Per cent change		
A. Forest land	–1 855.45	3 512.67	–2 284.2	–53.5	
B. Cropland	173.43	–7.33	–94.0	14.3	
C. Grassland	–502.70	–363.00	–414.2	–61.9	
D. Wetlands					
E. Settlements					
F. Other land					
G. Other					
6. Waste	–1 777.82	–877.23	–39.3	–18.2	Improved AD and EFs, change in method
A. Solid waste disposal on land	–1 286.10	–512.23	–35.4	–12.9	
B. Wastewater handling	–491.72	–362.72	–55.9	–42.9	
C. Waste incineration		–2.28		–28.2	
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	**–1 728.18**	**23 249.37**	**–0.5**	**8.8**	
Total CO_2 equivalent with LULUCF	**–3 912.90**	**26 391.70**	**–1.1**	**10.3**	

Abbreviations: AD = activity data, EF = emission factor, LULUCF = land use, land-use change and forestry, method = change in method, parameters = change in parameters.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

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Status report for Kazakhstan 2013. Available at <http://unfccc.int/resource/docs/2013/asr/kaz.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/KAZ. Report of the individual review of the inventory submission of Kazakhstan submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/kaz.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Irina Yesserkepova and Mr. Aleksey Cherednichenko (Joint Stock Company "Jassyl Damu"), including additional material on the methodology and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
C_a	activity coefficient corresponding to animals' feeding situation
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
CSF	fraction of carbon stored
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare
LULUCF	land use, land-use change and forestry
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
QA/QC	quality assurance/quality control
SF_6	sulphur hexafluoride
SWDS	solid waste disposal site
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change